

APPLICATION NOTE

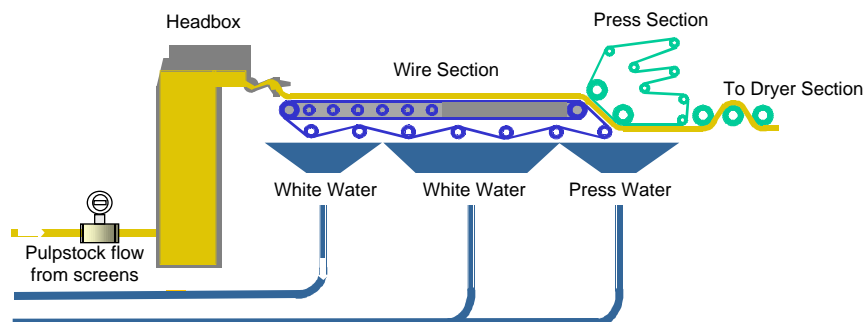
Paper Machine Basis Weight Measurement

INTRODUCTION

One of the more cost-effective measurements in a paper mill is the one that monitors the flow of pulp stock into the head box of the paper machine. The stock level in the head box directly affects the thickness of the stock being laid onto the forming screens and the thickness of the end product. Because there are normally variations in the thickness of the pulp stock as it is laid onto the forming screens, excess stock must be laid on to ensure that a minimum thickness is maintained. Since the finished product is measured by weight, this figure is referred to as the "basis weight" of the product. Basis weight is defined as the weight of 500 sheets of paper cut to a standard size, usually 17" x 22" for bond paper, 25" x 38" for text, offset, and coated papers, and 20" x 26" for cover papers.

APPLICATION

Magnetic flowmeters are often used to measure the flow of pulp stock into the head box. Since pulp stock tends to be a noisy measurement with a magnetic flowmeter, long damping times are traditionally used to smooth the output of the meter. Unfortunately, this results in slow response from the meter and wasted pulp stock because the level in the head box must be kept high to avoid gaps or voids in the final product. While reducing the damping in a pulsed DC magnetometer will result in quicker response, it can also result in a noisy signal. The end result is the valve controlling the pulp stock level in the head box



chatters away while effective level control in the head box, and the resulting thickness or "basis weight" of the end product is compromised.

SOLUTION

Yokogawa's unique simultaneous dual-frequency excitation method can offer benefits in this application which can result in tighter control, faster response, more end product per batch, greater profit and a direct cost savings to the customer. In slurries, such as pulp stock, noise is generated when solids collide with the electrode. The collision displaces a thin oxide layer present on most electrodes, and electrical noise is generated when the exposed metal re-oxidizes. Slurry noise has its greatest amplitude at low frequencies, so conventional magnetometers using low frequency DC excitation (7-12Hz) can suffer from slurry noise. High frequency AC meters using 60 to 65 Hz excitation do a good job of reducing slurry noise due to their high frequency sampling rate, but have problems with zero stability and poor accuracy, typically 1% of span. Yokogawa's dual-frequency

excitation method has the advantages of both high and low frequency excitation. Dual-frequency excitation provides fast response time, (0.1 seconds) excellent zero stability, 0.5% of rate accuracy and immunity to slurry noise.

Since dual-frequency excitation is all but immune to the noise generated by slurry and pulp stock flows, lower damping values can be used while maintaining tighter control and allowing less variation of the pulp stock level in the head box. Use of the Dead Time and Rate Limit functions can further reduce any noise that the dual-frequency excitation does not eliminate. This results in more consistent pressure from the head box to the forming screens and less variation in the thickness and basis weight of the end product. Since there is less variation in the end product, the mill can set its control point closer to the desired basis weight figure, reducing waste and resulting in more end product from the same amount of pulp stock. More end product means more profit from each batch.

As an example, the recent application of an Admag magnetic flowmeter at a major paper mill resulted in an estimated cost savings of several hundred thousand dollars a year on a large machine.

Another approach to solving slurry or pulp stock noise, used by some of our competitors, is the brute force approach or using high power to increase the signal to noise ratio.

There are several disadvantages in using high power to overcome noisy applications. The power consumption is considerably higher due to the extremely high drive current that is generated by the converter. That means a much higher cost of ownership and fewer instruments on that electrical circuit. The result is more electrical runs and higher installation costs in addition to the higher long term cost of operation. Some competitors use up to twenty times the drive current of Admag (3-5 amps vs Admag's 250 mA). Drive currents this high can lead to a number of failure modes. The coils may experience shortened service life, and the resulting heat buildup can cause liner failures if there is no flow to dissipate the heat. These are the same types of failure modes and cost of ownership issues that plagued AC meters in past years and drove the changeover to pulsed DC meters.

NOTES

1. The use of platinum electrodes rather than stainless steel can further improve immunity to slurry noise. Platinum is a harder material than stainless steel, and in addition, has excellent anti-oxidation characteristics. Output fluctuations can be reduced 1/3 to 1/10 that of electrodes made of stainless steel.

- Shorter damping times result in quicker response
- Lower long term cost of ownership
- Lower installation cost compared to high power converters
- Longer flow tube life compared to high power converters
- Less noise and a more stable output
- Tighter control and more end product per batch
- More Profit!!!

